

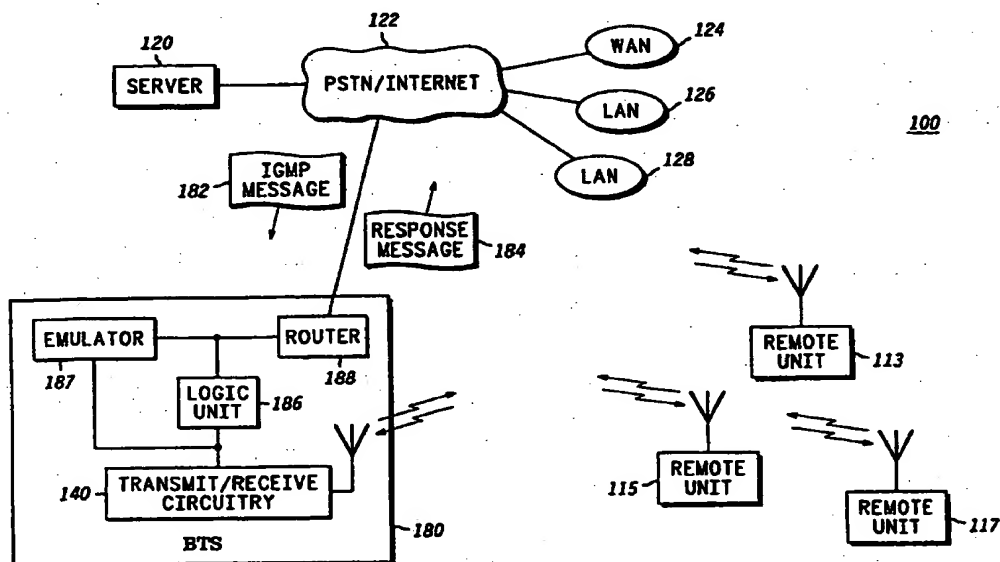


INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification ⁶ : H04J 13/00, 3/16, 3/24, H04B 15/00		A1	(11) International Publication Number: WO 00/04666
			(43) International Publication Date: 27 January 2000 (27.01.00)
(21) International Application Number: PCT/US99/16015 (22) International Filing Date: 14 July 1999 (14.07.99) (30) Priority Data: 09/118,166 17 July 1998 (17.07.98) US (71) Applicant: MOTOROLA INC. [US/US]; 1303 East Algonquin Road, Schaumburg, IL 60196 (US). (72) Inventors: RINCHIUSO, Joseph; 1205 Hirsch Street, Melrose Park, IL 60160 (US). FELIX, Kenneth, A.; 7213 Shales, Crystal Lake, IL 60014 (US). (74) Agents: HAAS, Kenneth, A. et al.; Motorola Inc., Intellectual Property Dept., 1303 East Algonquin Road, Schaumburg, IL 60196 (US).			(81) Designated States: BR, JP, KR, European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE). Published With international search report. With amended claims.

BEST AVAILABLE COPY

(54) Title: CHANNEL ASSIGNMENT WITHIN A BROAD-BAND COMMUNICATION SYSTEM



(57) Abstract

Remote units (113-117) that wish to receive a multicast session, monitor a multicast advertisement message on a system broadcast channel to determine a session to receive. Once a remote unit (113-117) requests participation in the multicast event, a common supplemental channel (205) is assigned to the remote unit (113-117), and the multicast session is broadcast to all remote units (113-117) currently participating in the multicast event. The common supplemental channel (205) utilizes two unique spreading codes for channel assignment, with one of the spreading codes being a function of the multicast session address (501) that is broadcast by the server (120).

FOR THE PURPOSES OF INFORMATION ONLY

Codes used to identify States party to the PCT on the front pages of pamphlets publishing international applications under the PCT.

AL	Albania	ES	Spain	LS	Lesotho	SI	Slovenia
AM	Armenia	FI	Finland	LT	Lithuania	SK	Slovakia
AT	Austria	FR	France	LU	Luxembourg	SN	Senegal
AU	Australia	GA	Gabon	LV	Latvia	SZ	Swaziland
AZ	Azerbaijan	GB	United Kingdom	MC	Monaco	TD	Chad
BA	Bosnia and Herzegovina	GE	Georgia	MD	Republic of Moldova	TG	Togo
BB	Barbados	GH	Ghana	MG	Madagascar	TJ	Tajikistan
BE	Belgium	GN	Guinea	MK	The former Yugoslav Republic of Macedonia	TM	Turkmenistan
BF	Burkina Faso	GR	Greece	ML	Mali	TR	Turkey
BG	Bulgaria	HU	Hungary	MN	Mongolia	TT	Trinidad and Tobago
BJ	Benin	IE	Ireland	MR	Mauritania	UA	Ukraine
BR	Brazil	IL	Israel	MW	Malawi	UG	Uganda
BY	Belarus	IS	Iceland	MX	Mexico	US	United States of America
CA	Canada	IT	Italy	NE	Niger	UZ	Uzbekistan
CF	Central African Republic	JP	Japan	NL	Netherlands	VN	Viet Nam
CG	Congo	KE	Kenya	NO	Norway	YU	Yugoslavia
CH	Switzerland	KG	Kyrgyzstan	NZ	New Zealand	ZW	Zimbabwe
CI	Côte d'Ivoire	KP	Democratic People's Republic of Korea	PL	Poland		
CM	Cameroon	KR	Republic of Korea	PT	Portugal		
CN	China	KZ	Kazakhstan	RO	Romania		
CU	Cuba	LC	Saint Lucia	RU	Russian Federation		
CZ	Czech Republic	LI	Liechtenstein	SD	Sudan		
DE	Germany	LK	Sri Lanka	SE	Sweden		
DK	Denmark	LR	Liberia	SG	Singapore		
EE	Estonia						

CHANNEL ASSIGNMENT WITHIN A BROAD-BAND COMMUNICATION SYSTEM

Field of the Invention

5

The present invention relates generally to communication systems and, in particular, to channel assignment within a broad-band communication system.

10

Background of the Invention

Communication systems are well known and consist of many types including land mobile radio, cellular radiotelephone, personal communication systems, and other communication system types. Within a communication system, transmissions are conducted between a transmitting device and a receiving device over a communication resource, commonly referred to as a communication channel. To date, the transmissions have typically consisted of voice signals. More recently, however, it has been proposed to carry other forms of signals, including high-speed data signals. For ease of operation, it is preferable to have the data transmission capability overlay the existing voice communication capability, such that its operation is essentially transparent to the voice communication system while still utilizing the communication resources and other infrastructure of the voice communication system.

One such communication system currently being developed with transparent data transmission capabilities is the next generation Code-Division Multiple-Access (CDMA) cellular communication system, more commonly referred to as cdma2000, or Wideband CDMA. Within such a communication system all remote unit and base station transmissions commonly occur simultaneously within the same frequency band. Therefore, a received signal at a base station or remote unit comprises a multiplicity of frequency and time overlapping coded signals from individual remote units or base stations, respectively. Each of these signals is transmitted simultaneously at the same radio frequency (RF) and is distinguishable only by its specific encoding (channel). In other words, the signal received at a base-station or remote unit receiver is a

composite signal of each transmitted signal and an individual signal is distinguishable only after decoding.

Next generation CDMA architecture must be able to provide an array of services comparable to wire-line services. One such service envisioned for the next generation CDMA architecture is multicasting. By definition, multicasting is a method which provides the delivery of information to multiple destinations without transmitting the same information content to each destination separately. A communication system providing this service must be capable of assigning a common channel to all users participating in the multicast event. Therefore, a need exists for a method and apparatus for channel assignment in a broadband communication system that is capable of assigning a common channel to all users participating in a multicasting session.

15

Brief Description of the Drawings

FIG. 1 is a block diagram of a communication system in accordance with the preferred embodiment of the present invention.

FIG. 2 is a block diagram of a base station of FIG. 1 in accordance with the preferred embodiment of the present invention.

FIG. 3 is a block diagram of fundamental channel circuitry of FIG. 2 for sending control messages to a remote unit in accordance with the preferred embodiment of the present invention.

FIG. 4 is a block diagram of supplemental channel circuitry of FIG. 2 for transmitting data in accordance with the preferred embodiment of the present invention.

FIG. 5 is an illustration of a long spreading code in accordance with the preferred embodiment of the present invention.

FIG. 6 is a flow chart illustrating operation of the logic unit of FIG. 1 in accordance with the preferred embodiment of the present invention.

FIG. 7 is a flow chart illustrating operation of the emulator of FIG. 1 in accordance with the preferred embodiment of the present invention.

FIG. 8 is a flow chart showing operation of the base station of FIG. 1 in accordance with the preferred embodiment of the present invention when a multicast transmission originates from a remote unit.

5

Detailed Description of the Drawings

To address the need for channel assignment in a broadband communication system, remote units that wish to receive a multicast session
10 monitor a multicast advertisement message on a system broadcast channel to determine a session to receive. Once a remote unit requests participation in the multicast event, a common supplemental channel is assigned to the remote unit, and the multicast session is broadcast to all remote units currently participating in the multicast event. The common supplemental channel utilizes two unique
15 spreading codes for channel assignment, with one of the spreading codes being a function of the multicast session address that is broadcast by the server.

The present invention encompasses a method for channel assignment within a broad-band communication system. The method comprises the steps of determining an address for a multicast transmission and assigning a first remote
20 unit a first spreading code based on the address for the multicast transmission.

Another embodiment of the present invention encompasses a method for channel assignment in a communication system where a plurality of channels are transmitted simultaneously at the same radio frequency (RF) and are distinguishable only by a spreading code. The method for channel assignment
25 comprises the steps of determining a first address for a first multicast transmission and determining a second address for a second multicast transmission. Next, a first plurality of remote units is assigned a first spreading code based on the address for the first multicast transmission, and a second plurality of remote units is assigned a second spreading code based on the address for the second multicast
30 transmission.

Finally, the present invention encompasses an apparatus for channel assignment within a broad-band communication system. The apparatus comprises a scrambler having a signal as an input and outputting a spread signal, wherein a

spreading code utilized to spread the signal is based on an address for a multicast transmission.

Turning now to the drawings, wherein like numerals designate like components, FIG. 1 is a block diagram of communication system 100 in accordance with the preferred embodiment of the present invention. In the preferred embodiment of the present invention, communication system 100 utilizes a next generation CDMA architecture as described in the cdma2000 International Telecommunication Union-Radiocommunication (ITU-R) Radio Transmission Technology (RTT) Candidate Submission document, but in alternate embodiments communication system 100 may utilize other analog or digital cellular communication system protocols such as, but not limited to, the next generation Global System for Mobile Communications (GSM) protocol, or the CDMA system protocol as described in "Personal Station-Base Station Compatibility Requirements for 1.8 to 2.0 GHz Code Division Multiple Access (CDMA) Personal Communication Systems" (American National Standards Institute (ANSI) J-STD-008). Communication system 100 includes server 120, Public Switched Telephone Network (PSTN) 122, Base Transceiver Station (BTS) 130, and remote units 113-117. Although not shown, communication system 100 comprises well known network elements such as Mobile Switching Centers (MSCs), Centralized Base Station Controllers (CBSCs), and the like.

In the preferred embodiment of the present invention server 120 is capable of providing a multicasting session over PSTN/internet 122 to clients such as Local Area Networks 126-128, Wide Area Network 124, and BTS 130. More particularly, server 120 utilizes the Internet Group Management Protocol (IGMP) as described in Request for Comments (RFC) document 1112 and RFC 2236 of the Internet Engineering Task Force (IETF) to provide multicasting. Remote units 113-117 that wish to receive a multicast session, monitor a multicast advertisement message on a system broadcast channel to determine a session to receive. Broadcast channels are part of the common forward physical/paging channel as described in Mobile Station-Base Station Compatibility Standards for Dual-Mode Wideband Spread Spectrum Cellular Systems, Telecommunications Industry Association Interim Standard 95A, Washington, DC July 1993 (IS-95A), which is incorporated by reference herein.

In the preferred embodiment of the present invention, advertisement messages include information about multicast events available to remote units 113-117. The information includes the session's Internet Protocol (IP) address, port number, time and duration of the transmission, and a brief description of the event. Base station 130 will join a multicast session and forward it over the air interface via a high-speed data channel (supplemental channel) if there is at least one remote unit 113-117 that requested participation in the session. Once a remote unit requests participation in the multicast event, a common supplemental channel is assigned to the remote unit, and the multicast session is broadcast to all remote units currently participating in the multicast event. As discussed in greater detail below, the common supplemental channel utilizes two unique spreading codes for channel assignment, with one of the spreading codes being a function of the multicast session address that is broadcast by server 120. Additionally, in order to minimize messaging over the air interface, emulator 137 is utilized to emulate messaging that normally occurs between server 120 and any device receiving the multicast (e.g., remote units receiving the multicast session).

FIG. 2 is a block diagram of base station 130 of FIG. 1 in accordance with the preferred embodiment of the present invention. Base station 130 comprises logic unit 136, emulator 137, router 138, transmit/receive circuitry 140 comprising one or more common control channel circuits 201, one or more fundamental channel circuits 203, one or more supplemental channel circuits 205, summer 211, and modulator 215. In the preferred embodiment of the present invention, communication to remote unit 113 may take place utilizing the supplemental channel circuitry 205 and/or fundamental channel circuitry 203. In particular, base station 130 utilizes two classes of channels defined for both forward and reverse transmission. In the preferred embodiment, the fundamental channels are similar to existing CDMA traffic channels used for voice and signaling, except spread over a wider bandwidth. Similarly, the common control channel is used for passing system information and control signaling, along with multicast advertisement information. When transmitting a multicast session, fundamental channels or common control channels are utilized to transmit emulated Internet Group Management Protocol (IGMP) messages for subscribing and de-subscribing to a multicast session. CDMA traffic and common control channels are described in detail in IS-95A as well as the RTT Candidate Submission

Document. Additionally, soft handoff (simultaneous communication utilizing more than one fundamental channel circuit 203) is supported utilizing fundamental channel circuitry 203. Supplemental channel circuitry 205 are utilized for communicating high data rate services (e.g., multicast packet data) to remote unit 113. The data rate of the supplemental channels is specified prior to transmission. Multiple data sources are time multiplexed on this channel. In addition, the Quality-of-Service (e.g., Frame Error Rate (FER), Bit Error Rate (BER) and/or Transmission Delay) of this channel may be set and operated independently of the fundamental channel.

10 Data transmission and channel assignment from base station 130 in accordance with the preferred embodiment of the present invention occurs as follows: Reverse Access (Common Control) channel circuitry receives a subscribe message from a remote unit to join a multicast session. As described above, the subscribe message comprises an emulated IGMP message for
15 subscribing to the multicast session. Logic unit 136 determines if it is currently subscribed to the requested multicast session (i.e., another remote unit is currently subscribed to the session) and if so, an acknowledgment (Ack) message is sent to the remote unit. In the preferred embodiment of the present invention the Ack message contains the current channel (i.e., the assigned Walsh code and the long
20 code), with the long code being a function of the multicast IP address. In other words, the Ack message contains the Supplemental Channel Walsh code and long code that is used by the remote unit to demodulate the multicast session. In the preferred embodiment, if base station 130 is not currently subscribed to the multicast session, logic unit 136 determines the multicast address and sends a
25 query message to router 138 requesting to join the multicast session. In turn router 138 sends an IGMP message to an upstream router that is located within the PSTN/Internet network 122. This process continues until a upstream router that is currently receiving the multicast session is located. In the preferred embodiment this is accomplished by sending an IGMP message to router 138 as described in
30 RFC 1112 and/or RFC 2236. Thereafter, base station 130 sends an Ack message to the remote unit.

Although the above description was given with respect to a single remote unit, multiple remote units may join the multicast session in a similar manner, resulting in multiple remote units utilizing the same spreading codes (i.e., Walsh

and long codes) to de-scramble the particular session. Additionally, multiple multicast sessions can be simultaneously broadcast from a single base station, resulting in at least a first group of remote units utilizing a first spreading code based on an address for a first multicast transmission, and a second group of remote units utilizing a second spreading code based on an address for a second multicast transmission.

FIG. 3 is a block diagram of fundamental channel circuitry 203 of FIG. 2 for sending control messages to remote units in accordance with the preferred embodiment of the present invention. Fundamental channel circuitry 203 includes channel multiplexer 301, convolutional encoder 312, symbol repeater 315, block interleaver 316, long code scrambler 317, and orthogonal encoder 320. During operation, data bits 310 (emulated IGMP message to be transmitted over the air interface) are received by channel multiplexer 301 at a particular bit rate. Emulated IGMP message 310 typically includes control messages such as Subscribe and De-subscribe messages. Channel multiplexer 301 multiplexes secondary traffic (e.g., data), and/or signaling traffic (e.g. control or user messages) onto the emulated IGMP message 310 and outputs the multiplexed data at 9.6 kbit/sec to convolutional encoder 312. Convolutional encoder 312 encodes input data bits 310 into data symbols at a fixed encoding rate with an encoding algorithm which facilitates subsequent maximum likelihood decoding of the data symbols into data bits (e.g. convolutional or block coding algorithms). For example, convolutional encoder 312 encodes input data bits 310 (received at a rate of 9.6 kbit/second) at a fixed encoding rate of one data bit to two data symbols (i.e., rate 1/3) such that convolutional encoder 312 outputs data symbols 214 at a 28.8 ksymbol/second rate.

Data symbols 314 are then repeated by repeater 315 and input into interleaver 316. Interleaver 316 interleaves the input data symbols 314 at the symbol level. In interleaver 316, data symbols 314 are individually input into a matrix which defines a predetermined size block of data symbols 314. Data symbols 314 are input into locations within a matrix so that the matrix is filled in a column by column manner. Data symbols 314 are individually output from locations within the matrix so that the matrix is emptied in a row by row manner. Typically, the matrix is a square matrix having a number of rows equal to the number of columns; however, other matrix forms can be chosen to increase the

output interleaving distance between the consecutively input non-interleaved data symbols. Interleaved data symbols 318 are output by interleaver 316 at the same data symbol rate that they were input (e.g., 28.8 ksymbol/second). The predetermined size of the block of data symbols defined by the matrix is derived from the maximum number of data symbols which can be transmitted at a predetermined symbol rate within a predetermined length transmission block. For example, if the predetermined length of the transmission block is 20 milliseconds, then the predetermined size of the block of data symbols is 28.8 ksymbol/second times 20 milliseconds which equals 576 data symbols which defines a 18 by 32 matrix.

Interleaved data symbols 318 are scrambled by scrambler 317 and output to orthogonal encoder 320. In particular, long code scrambler 317 scrambles symbols 318 by modulo 2 adding symbols 318 with a user-specific Long Code. The scrambled symbols are then output to orthogonal encoder 320, where encoder 320 modulo 2 adds an orthogonal code (e.g., a 256-ary Walsh code) to each interleaved and scrambled data symbol 318. For example, in 256-ary orthogonal encoding, interleaved and scrambled data symbols 318 are each exclusive OR'd by a 256 symbol orthogonal code. These 256 orthogonal codes preferably correspond to Walsh codes from a 256 by 256 Hadamard matrix wherein a Walsh code is a single row or column of the matrix. Orthogonal encoder 320 repetitively outputs a Walsh code which corresponds to input data symbol 318 at a fixed symbol rate (e.g., 28.8 ksymbol/second).

Sequence of Walsh codes 342 are further spread by a pair of short pseudorandom codes 324 (i.e. short when compared to the long code) to generate an I-channel and Q-channel code spread sequence 326. The I-channel and Q-channel code spread sequences 326 are used to bi-phase modulate a quadrature pair of sinusoids by driving the power level controls of the pair of sinusoids. The sinusoids output signals are summed, QPSK modulated (by modulator 215) and radiated by antenna 121 to complete transmission of channel data bits 310. In the preferred embodiment of the present invention, spread sequences 226 are output at a rate of 3.6864 Mega Chips per second (Mcps) and radiated within a 5 MHz bandwidth, but in alternate embodiments of the present invention, spread sequences 226 may be output at a different rate and radiated within a different bandwidth. For example, in an alternate embodiment of the present invention an

IS-95A transmission scheme may be utilized where spread sequences 326 are output at a rate of 1.2288 Mcps (traffic channel chip rate) within a 1.25 MHz bandwidth.

FIG. 4 is a block diagram of supplemental channel circuitry 205 of FIG. 2 for transmitting data (e.g., multicast traffic) in accordance with the preferred embodiment of the present invention. Supplemental channel circuitry 205 includes channel multiplexer 401, convolutional encoder 412, symbol repeater 415, block interleaver 416, and orthogonal encoder 420. During operation, signal 410 (multicast packet data) is received by channel multiplexer 401 at a particular bit rate (e.g., 152.4 kbit/second). Channel multiplexer 401 multiplexes secondary traffic (e.g., user data) onto the supplemental channel data 410 and outputs the multiplexed data to convolutional encoder 412 at 153.6 kb/s.

Convolutional encoder 412 encodes input data bits 410 into data symbols at a fixed encoding rate with an encoding algorithm which facilitates subsequent maximum likelihood decoding of the data symbols into data bits (e.g., convolutional or block coding algorithms). For example, convolutional encoder 412 encodes input data bits 410 (received at a rate of 153.6 kbit/second) at a fixed encoding rate of one data bit to two data symbols (i.e., rate 1/3) such that convolutional encoder 412 outputs data symbols 414 at a 460.8 kbit/second rate.

Data symbols 414 are then input into interleaver 416. Interleaver 416 interleaves the input data symbols 414 at the symbol level. In interleaver 416, data symbols 414 are individually input into a matrix which defines a predetermined size block of data symbols 414. Data symbols 414 are input into locations within a matrix so that the matrix is filled in a column by column manner. Data symbols 414 are individually output from locations within the matrix so that the matrix is emptied in a row by row manner. Typically, the matrix is a square matrix having a number of rows equal to the number of columns; however, other matrix forms can be chosen to increase the output interleaving distance between the consecutively input non-interleaved data symbols. Interleaved data symbols 418 are output by interleaver 416 at the same data symbol rate that they were input (e.g., 460.8 ksymbol/second). The predetermined size of the block of data symbols defined by the matrix is derived from the maximum number of data symbols which can be transmitted at a predetermined symbol rate within a predetermined length transmission block. For

example, if the predetermined length of the transmission block is 20 milliseconds, then the predetermined size of the block of data symbols is 9.216 ksymbols.

Interleaved data symbols 418 are scrambled by scrambler 417 and output to orthogonal encoder 320. In particular, long code scrambler 417 scrambles symbols 418 by modulo 2 adding symbols 418 with a group-specific long code. As shown in FIG. 5, the group-specific long code is a function of a specific address (IP address) for server 120. In the preferred embodiment of the present invention the least significant 32 bits of the multicast session address 501 are utilized as the group-specific long code along with a 10 bit header, resulting in a long code having the session address 501 embedded therein.

Continuing, the scrambled symbols are then output to orthogonal encoder 420, where encoder 420 modulo 2 adds an orthogonal code (e.g., a 16-ary Walsh code) to each interleaved and scrambled data symbol 418. In the preferred embodiment of the present invention, each multicast session utilizes the same spreading (Walsh) code for every remote unit 113-117 participating in the multicast session. Thus, the same 16-ary spreading code is utilized by all remote units currently participating in the multicast session. In 16-ary orthogonal encoding, interleaved and scrambled data symbols 418 are each exclusive OR'd by a 16 symbol orthogonal code. These 16 orthogonal codes preferably correspond to Walsh codes from a 16 by 16 Hadamard matrix wherein a Walsh code is a single row or column of the matrix. Orthogonal encoder 420 repetitively outputs a Walsh code or its inverse which corresponds to input data symbol 418 at a fixed symbol rate (e.g., 460.8 ksymbol/second).

Sequence of weighted Walsh codes 442 are further spread by a pair of short pseudorandom codes 424 (i.e. short when compared to the long code) to generate an I-channel and Q-channel code spread sequence 426. The I-channel and Q-channel code spread sequences 426 are used to bi-phase modulate a quadrature pair of sinusoids by driving the power level controls of the pair of sinusoids. The sinusoids output signals are summed, QPSK modulated (by modulator 215) and radiated by antenna 121 to complete transmission of channel data bits 410. In the preferred embodiment of the present invention, spread sequences 426 are output at 3.6864 Mcps and radiated within a 5 MHz bandwidth.

FIG. 6 is a flow chart illustrating operation of the logic unit of FIG. 1 in accordance with the preferred embodiment of the present invention. The logic

flow begins at step 601 where logic unit 136 receives a message (IGMP subscribe message) from a remote unit that wishes to join a multicast session. Next, at step 603, logic unit 136 determines if it has already joined the multicast session. In particular, logic unit 136 determines if any remote unit in communication with
5 base station 130 is already subscribed to the multicast session, and if not the logic flow continues to step 605, otherwise the logic unit continues to step 607. At step 605 logic unit determines the address for the multicast session and subscribes to the multicast session by IGMP messaging as described in RFC 1112 and RFC 2236, and the logic flow continues to step 607. At step 607 a common
10 supplemental channel is assigned and the specific channel is broadcast (via an Ack message) to the remote unit. As discussed above two particular spreading codes are utilized by all remote units participating in the multicast session. The first spreading code is a Walsh code unique to the RF channel, and the second spreading code is a group-specific long that comprises the specific multicast
15 session address (IP address) from the multicast server 120. Finally, at step 609 the multicast session is broadcast to the remote over an air interface via a channel defined by the first and the second spreading codes.

FIG. 7 is a flow chart illustrating operation of the emulator of FIG. 1 in accordance with the preferred embodiment of the present invention. The logic
20 flow begins at step 701 where emulator 137 receives a first set of data from router 138. In the preferred embodiment of the present invention the first set of data is multicast packet data transmitted from server 120 and destined to at least one remote unit communicating with base station 130. Next, at step 703, emulator 137 receives a second set of data from router 138. In the preferred embodiment of
25 the present invention the second set of data is control data for the current multicast session being broadcast from server 120. In particular, the second set of data is IGMP messaging 132 as described in RFC 1112 and RFC 2236 as published by the Internet Engineering Task Force (IETF). Next, at step 705, the first set of data is transmitted to a remote unit as discussed above with reference to FIG. 4.
30 Finally, at step 707, emulator 137 responds to the second set of data (via response message 134) without transmitting the control messages to the remote unit. In particular, certain IGMP messages such as Membership Query Messages, Leave Group Messages, and Membership Report Messages require a response from the recipient of the multicast session. In order to reduce transmission over the air

interface, only the first set of data is transmitted to the remote unit, while emulator 137 responds to the particular IGMP message via response message 134. This approach increases system capacity in a wireless CDMA network since unnecessary transmissions (e.g., IGMP messages) over the air interface are reduced. In the preferred embodiment a remote unit only transmits subscribe and de-subscribe (emulated IGMP) messages. Furthermore, no IGMP messages described in RFC 1112 and RFC 2236 are transmitted over the air interface.

FIG. 8 is a flow chart showing operation of base station 130 when a multicast transmission originates from a remote unit in communication with base station 130. In other words, instead of originating from server 120, the multicast transmission is now originating from a remote unit in communication with base station 130. The logic flow begins at step 801 where a request for a multicast transmission is received from a remote unit. Next, at step 805 logic unit 136 determines an unused address for the multicast session. In particular, as described in RFC 1112 and RFC 2236, logic unit 136 determines unused IP addresses by listening to IGMP messages. At step 810, the unused address is assigned to the remote unit, and then transmitted to the remote unit via downlink transmission. The IP address is then utilized by the remote unit and is embedding into an IP header as and is used as the multicast address as described in RFC 1112 and RFC 2236. This approach increases system capacity in a wireless CDMA network since no multicast control messages (e.g., IGMP messages) are transmitted over the air interface.

While the invention has been particularly shown and described with reference to a particular embodiment, it will be understood by those skilled in the art that various changes in form and details may be made therein without departing from the spirit and scope of the invention and it is intended that all such changes come within the scope of the following claims and their equivalents:

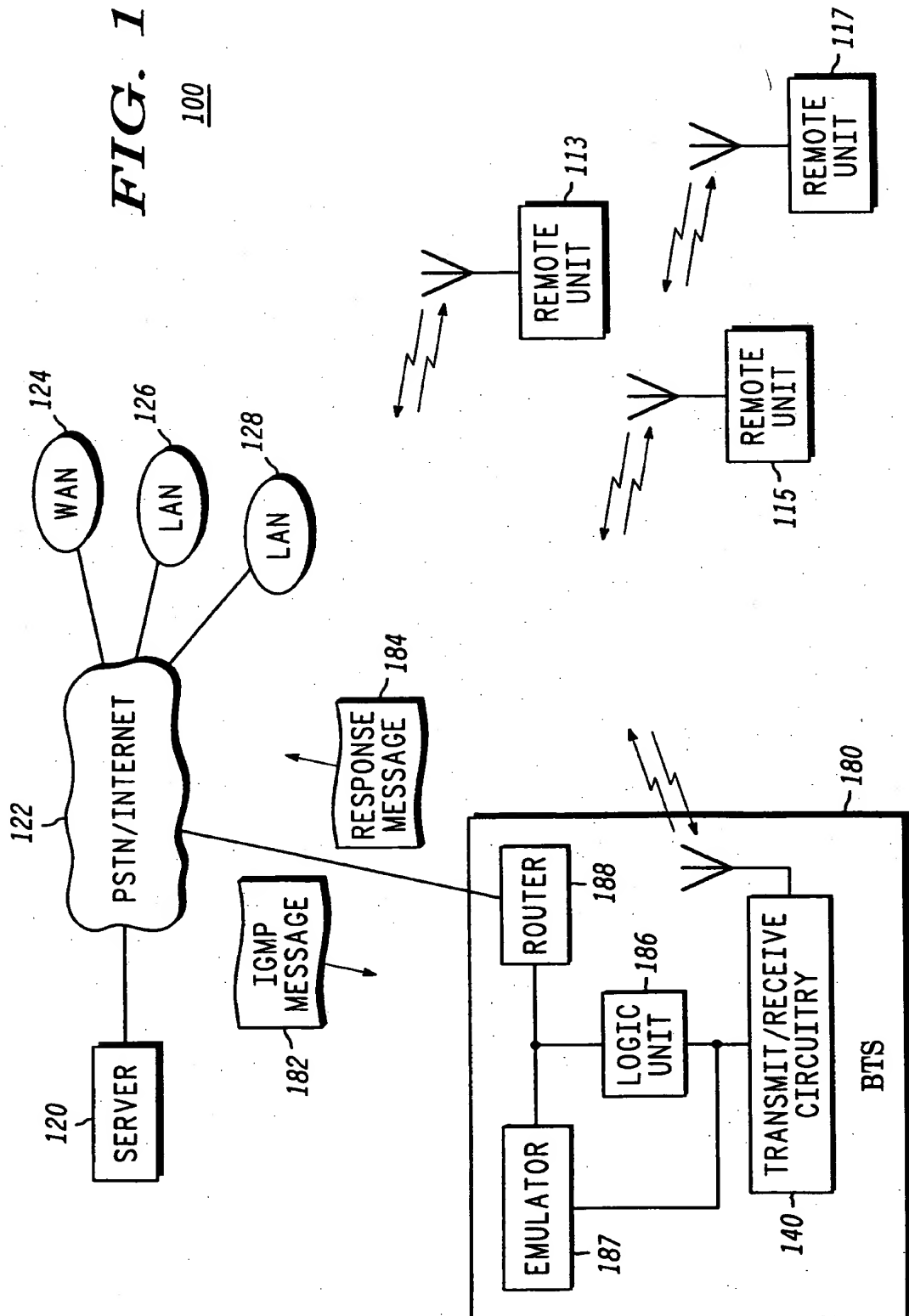
CLAIMS

1. A method for channel assignment within a broad-band communication system, the method comprising the steps of:
determining an address for a multicast transmission; and
5 assigning a first remote unit a first spreading code based on the address for the multicast transmission.
2. The method of claim 1 wherein the step of determining the address for the multicast transmission comprises the step of determining an Internet Protocol (IP)
10 address for the multicast transmission.
3. The method of claim 1 further comprising the step of assigning a second remote unit the first spreading code based on the address for the multicast transmission.
15
4. The method of claim 3 further comprising the step of assigning the first and the second remote unit a second spreading code.
5. The method of claim 4 wherein the step of assigning the first and the second
20 remote unit the second spreading code comprises the step of assigning the first and the second remote unit a common Walsh code.
6. An apparatus for channel assignment within a broad-band communication system, the apparatus comprising a scrambler having a signal as an input and
25 outputting a spread signal, wherein a spreading code utilized to spread the signal is based on an address for a multicast transmission.
7. The apparatus of claim 6 wherein the address for the multicast transmission comprises an Internet Protocol (IP) address for the multicast transmission.
30
8. The apparatus of claim 6 wherein the spreading code comprises a spreading code having the address embedded therein.
9. The apparatus of claim 6 wherein the spreading code is a long code.

AMENDED CLAIMS

[received by the International Bureau on 09 November 1999 (09.11.99);
original claim 8 cancelled; original claims 1-2 and 6-7 amended;
remaining claims unchanged (1 page)]

1. A method for channel assignment within a broad-band communication system, the method comprising the steps of:
determining an address for a multicast transmission; and
assigning a first remote unit a first spreading code having the address embedded therein.
2. The method of claim 1 wherein the step of determining the address for the multicast transmission comprises the step of determining an Internet Protocol address for the multicast transmission.
3. The method of claim 1 further comprising the step of assigning a second remote unit the first spreading code based on the address for the multicast transmission.
4. The method of claim 3 further comprising the step of assigning the first and the second remote unit a second spreading code.
5. The method of claim 4 wherein the step of assigning the first and the second remote unit the second spreading code comprises the step of assigning the first and the second remote unit a common Walsh code.
6. An apparatus for channel assignment within a broad-band communication system, the apparatus comprising a scrambler having a signal as an input and outputting a spread signal, wherein a spreading code utilized to spread the signal has an address for a multicast transmission embedded therein.
7. The apparatus of claim 6 wherein the address for the multicast transmission comprises an Internet Protocol address for the multicast transmission.
8. The apparatus of claim 6 wherein the spreading code is a long code.



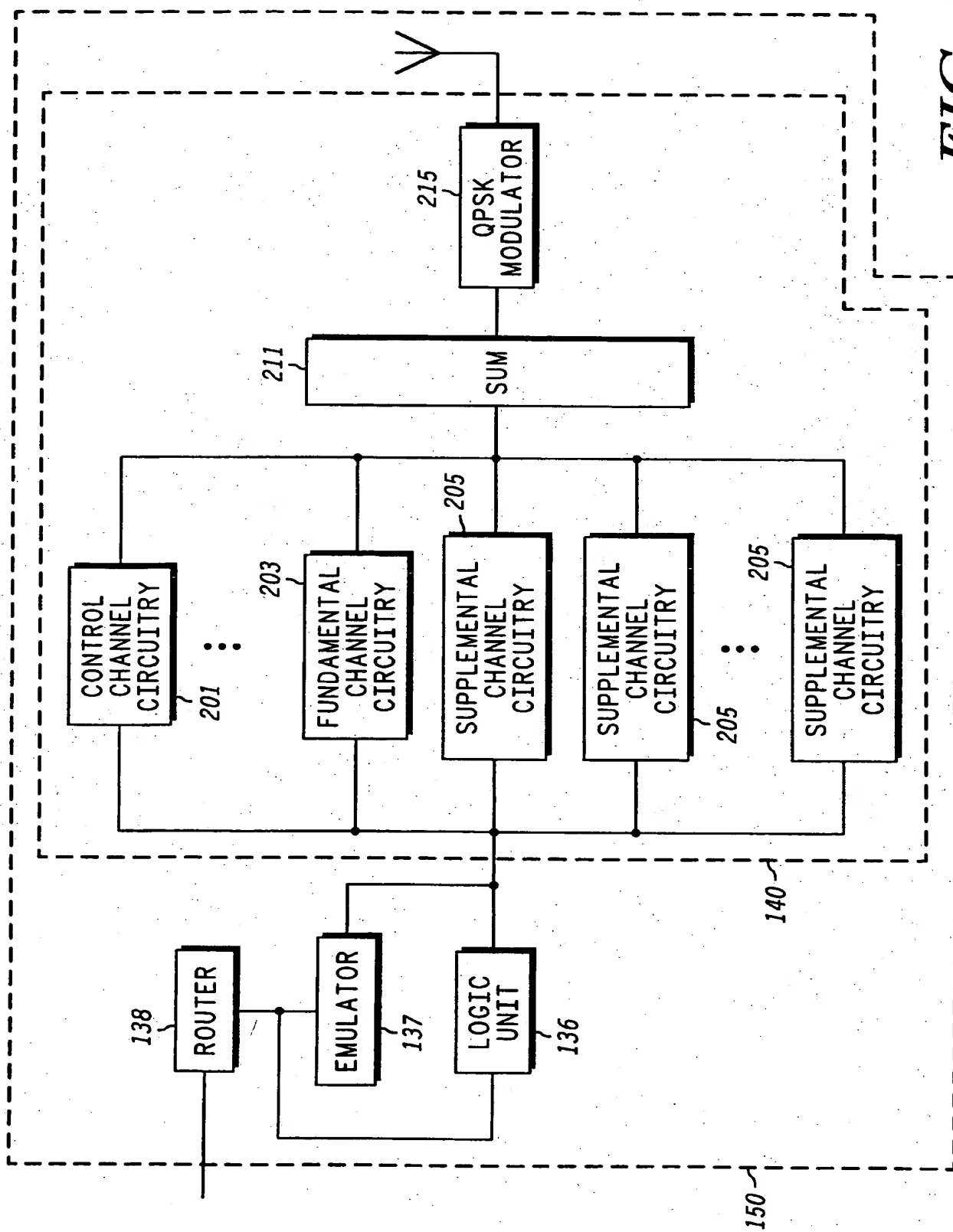


FIG. 2

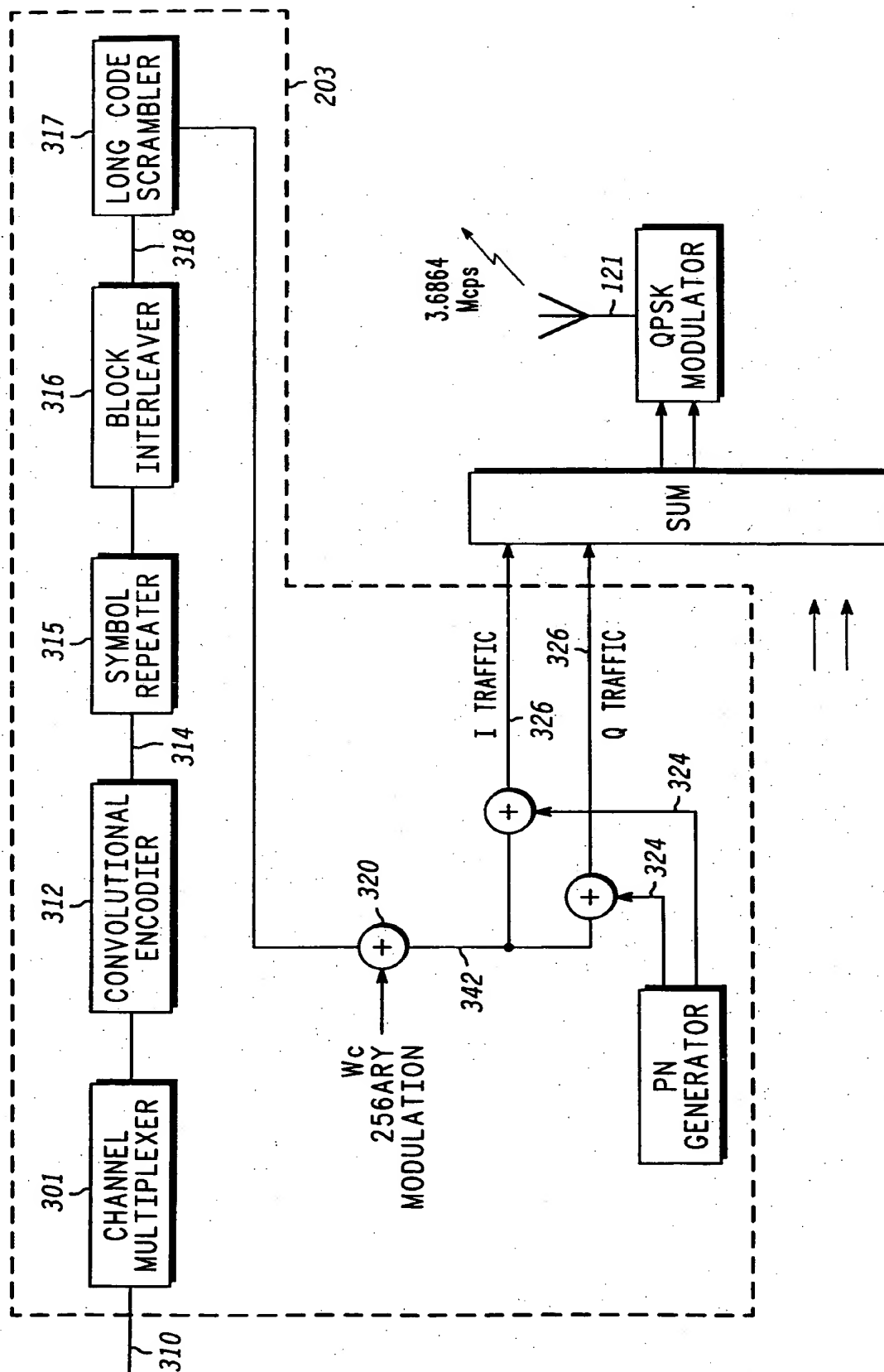


FIG. 3

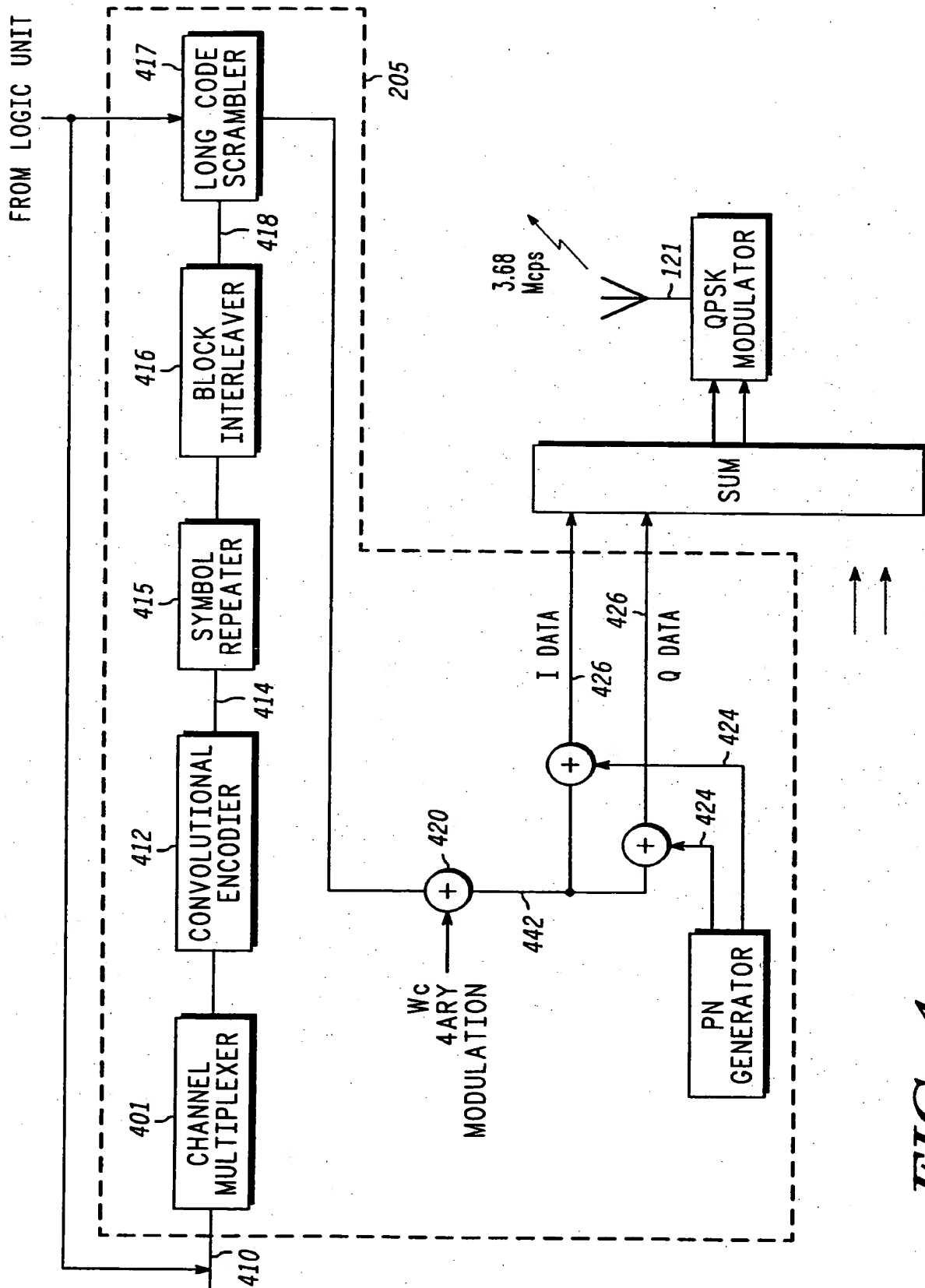
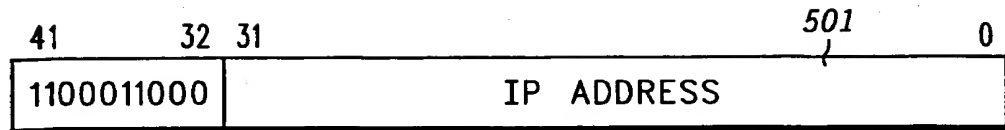
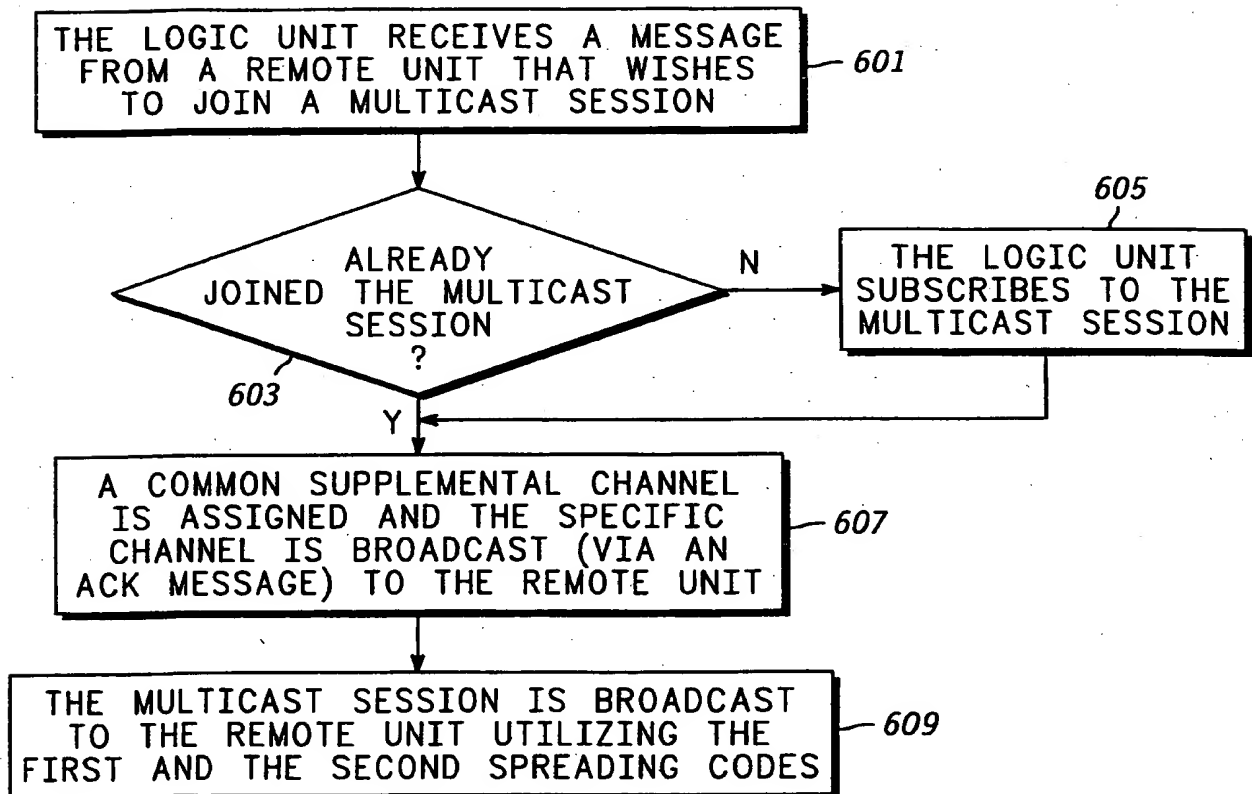
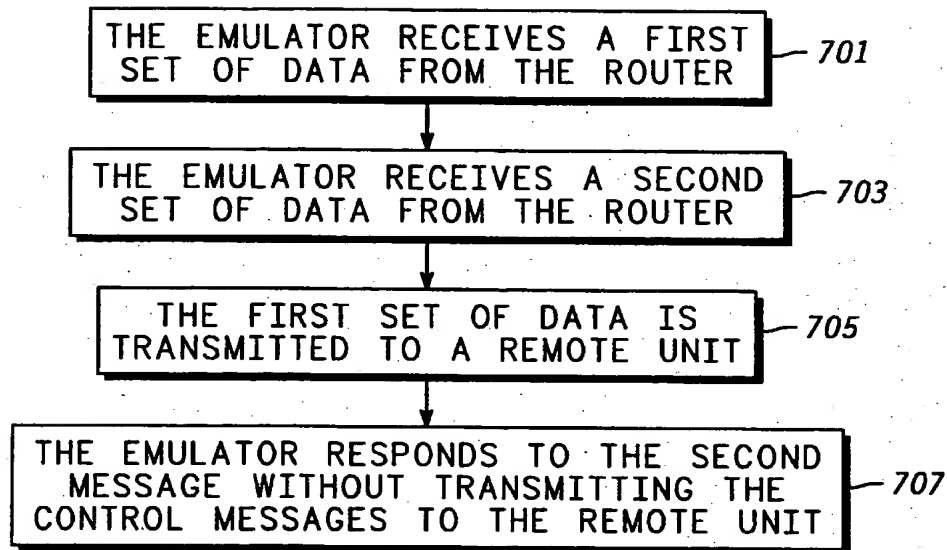
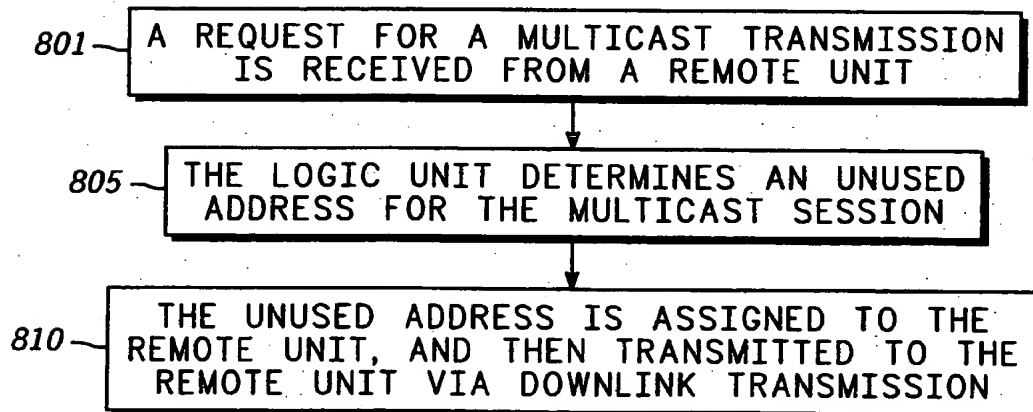


FIG. 4

5/6

*FIG. 5**FIG. 6*

6/6

**FIG. 7****FIG. 8**

INTERNATIONAL SEARCH REPORT

International application No.

PCT/US99/16015

A. CLASSIFICATION OF SUBJECT MATTER

IPC(6) :HO4J 13/00, 3/16, 3/24; HO4B 15/00

US CL :Please See Extra Sheet.

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

U.S. : 370/310, 320, 335, 342, 346, 347, 348, 394, 397, 411, 432, 519; 375/200, 208, 347

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

Please See Extra Sheet.

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US 5,526,352 A (MIN et al) 11 June 1996, col. 4 lines 52-65, col. 4 line 66 to col. 5 line 13, and col. 13 lines 35-51.	1, 3-6, 9
Y,P	US 5,887,252 A (NONEMAN) 23 March 1999, col. 1 line 17 to col. 2 line 4.	1, 3-6, 9
Y	US 5,734,652 A (KWOK) 31 March 1998, col. 4 lines 44-54.	2, 7
A	US 5,930,248 A (LANGLET et al) 27 July 1999, see entire document.	1-9



Further documents are listed in the continuation of Box C.



See patent family annex.

* Special categories of cited documents:	*T* later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
A document defining the general state of the art which is not considered to be of particular relevance	*X* document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
E earlier document published on or after the international filing date	*Y* document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
L document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)	*Z* document member of the same patent family
O document referring to an oral disclosure, use, exhibition or other means	
P document published prior to the international filing date but later than the priority date claimed	

Date of the actual completion of the international search

27 AUGUST 1999

Date of mailing of the international search report

21 OCT 1999

Name and mailing address of the ISA/US
Commissioner of Patents and Trademarks
Box PCT
Washington, D.C. 20231
Facsimile No. (703) 305-3230

Authorized officer

SHICK HOM

Telephone No. (703) 305-4742

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US99/16015

A. CLASSIFICATION OF SUBJECT MATTER:

US CL :

370/310, 320, 335, 342, 346, 347, 348, 394, 397, 411, 432, 519; 375/200, 208, 347

B. FIELDS SEARCHED

Electronic data bases consulted (Name of data base and where practicable terms used):

APS

search terms: multicast, spreading code, address, Internet Protocol, spreading code with embedded address, long code, Walsh code

**This Page is Inserted by IFW Indexing and Scanning
Operations and is not part of the Official Record**

BEST AVAILABLE IMAGES

Defective images within this document are accurate representations of the original documents submitted by the applicant.

Defects in the images include but are not limited to the items checked:

- ☐ **BLACK BORDERS**
- ☐ **IMAGE CUT OFF AT TOP, BOTTOM OR SIDES**
- ☒ **FADED TEXT OR DRAWING**
- ☐ **BLURRED OR ILLEGIBLE TEXT OR DRAWING**
- ☐ **SKEWED/SLANTED IMAGES**
- ☐ **COLOR OR BLACK AND WHITE PHOTOGRAPHS**
- ☐ **GRAY SCALE DOCUMENTS**
- ☐ **LINES OR MARKS ON ORIGINAL DOCUMENT**
- ☐ **REFERENCE(S) OR EXHIBIT(S) SUBMITTED ARE POOR QUALITY**
- ☐ **OTHER:** _____

IMAGES ARE BEST AVAILABLE COPY.

As rescanning these documents will not correct the image problems checked, please do not report these problems to the IFW Image Problem Mailbox.